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Blood4U: A Novel Approach for Blood Collection

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Abstract: ***Blood4U is new perspective for health that provides healthcare services by using the mobile devices and communication technologies. We developed android based blood donation application as Blood4U solutions to build a connection between the acceptor and donor at anytime and anywhere. The main aim of developing this application is to reduce the time to a great extent that is spent in searching for the right donor and the availability of blood required by specifying urgency of acceptor in the application. Thus this application provides the required information and updating in time and also helps in quicker decision making by broadcasting message from acceptor to all donors that are registered in the application. To assess our application, we build acceptor-donor profiles and examine that it will assist to upgrade the timely access of the details and quick acknowledgement in urgent condition.***

Keywords: Blood4U, Acceptor, Donors, Healthcare services, Mobile devices.

I. INTRODUCTION

Blood4U is the branch of health that use mobile phones, information, and communication technology for the delivery of health services. It permit individuals to observe their health status, send healthcare details to the doctors, decrease the costs, and showing probable advances through information sharing. The applications includes appointment reminders, community mobilization and health promotion, mobile telemedicine, public health emergencies, patient monitoring and many more [I] In both developed and developing countries, numbers of smart phone users are enlarging day by day. For example: there are more than 29 million smart phones owned by Turkish and estimated to reach more than 35 million by 2019 [2]. Smartphone runs a complete operating system and provides a platform for application developers and users. Google Android is one of the most competitive markets due to its open source platform. Hundreds of applications have been developed ranging from the interactive games to healthcare domain. Especially the medical domain applications enable the users to interact with the system to provide real time user assistance and help to improve the human life's style [3] [4]. Blood transfusion is a vital component of health care. It contributes to saving millions of lives each year in both routine and emergency situations. Furthermore, it dramatically improves the life expectancy and quality of life of patients with a variety of acute and chronic conditions [I]. Blood transfusion services are based on voluntary blood donation. During the next 5-10 years, availability of the blood will be essential to meet the demands of ageing populations [5]. Similarly, in case of operation or treatment, hospital workers asked the patient's relatives for the blood donation or relatives need to find some donor who has the compatibility of blood group with the patient. This emergency situation raises many challenges to find the donors. New approaches are needed to meet the demand of the society. We developed android based blood donation application that keeps the record of volunteer blood donors. In case of emergency situation, application can broadcast the message along the blood group and hospital information to all the registered donors for donation. We utilized the cloud computing service for keeping the application information available anywhere and anytime. The main feature of our application is to use it as a volunteer blood donor as well requester. Requester can broadcast the message along urgency sign of required blood to the registered users and notification message will send to all the volunteer blood donors. Once a volunteer blood donor will confirm the blood donation then it will be marked as donor found in the receipt list. Our application may help to give timely access to the blood donors and requester to handle the urgent situation. This paper presents the details of development and prototype of proposed architecture. We structure our paper as follows: Section II outlines relevant research projects of Blood4U and the capability of smart phone to improve various kinds of health care applications. In section Ill, we present architecture for blood donation application and identify a number of requirements the system should fulfill. Section IV describes the implementation details and application interfaces. Finally conclusions are reported in Section V.

II. RELATED WORK

A large number of mHealth solutions have been developed for the provision of healthcare. In this series, Chen et al. [4] presented patient monitoring use case of mHealth to highlight the new needs in terms of data access control, location awareness, prioritization and mobility levels while developing the mHealth solution. Kirtava et al. [6] presented mHealth solution for cardiac patients. They reported feasible methodology to monitor cardiac arrhythmia in outpatients in Georgia, promoting earlier discharge of nonlife-threatening cases, improving patients' comfort of life and increasing their mobility with enhanced safety. Similarly, Karagiannaki et

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al. [7] presented the conceptual design and prototype development of mMamee, a mHealth platform for monitoring and analyzing the environmental exposures of women in maternity. The core objective is to produce a way to the physicians for monitoring and alert services for the benefits of the patient. Rahman et al. [8] presented location-aware mobile phone based blood donor recruitment, information retrieval and management system that aims to ensuring the quality of the blood and increasing the efficiency of operation management. Similarly, Islam et al. [9] developed blood donation service. Their solution is SMS-based to query for a blood group. The server matches the blood type and location with the profiles of registered donors, retrieves the information and sends it to the client along mobile number of the registered donors. Their solution is one-way communication and user needs to reach these donors by making phone call. Our solution is ubiquitous and donor will receive information alert about the requested blood and if he/she is willing to donate the blood at the moment then response immediately. Furthermore, once request is fulfilled our service will update the status of the requested blood to be completed. The details of our Blood4U solution are given below.

III. PROPOSED WORK

We explore the requirements in terms of communication, storage, processing and smart phone development platform to make it an acceptable solution. We proposed architecture of blood donation application. It is divided into three sub-components volunteer blood donors, sqlite manager and blood requester. A. Volunteer Blood Donors In the proposed architecture, voluntary blood donor is viewed as an intelligent agent that receives the information alert about the requested blood through a smart phone application. Initially, each donor registered him or herself with our developed platform. Once they become valid donors, they are able to receive the information about the required blood type, hospital information, requester contact details and urgency of blood. We highlight the urgency of blood in our application with red, yellow and green color by giving the priorities as high, normal and low respectively. Donors will be able to realize the emergency situation and will be encouraged to donate blood eagerly. Furthermore, to make the information available about the donors under the low cost and high availability, we take the advantage of cloud computing paradigm. B. SQLite Manager SQLite is an in-process library that implements
a self-contained, serverless, zero-configuration, transactional SQL database engine. The code for SQLite is in the public domain and is thus free for use for any purpose, commercial or private. SQLite is the most widely deployed database in the world with more applications than we can count, including several high-profile projects.SQLite is an embedded SQL database engine. Unlike most other SQL databases, SQLite does not have a separate server process. SQLite reads and writes directly to ordinary disk files. The features are managing any SQLite database on your computer. You can browse and search the tables, as well as add, edit, delete and duplicate the records. Facility to execute any SQL query. Easy access to common operations through menu, toolbars, buttons and context-menu. Blood Requester The blood requester/recipient requires registering with our proposed application by specifying required blood group, hospital and type of urgency. The cloud server is responsible to broadcast the data to all the registered voluntary blood donors. We defined two way communication scenarios in our proposed system. Firstly, recipient request the blood donation along urgency status either high or low. Any available volunteer blood donor can response the requested blood and requester will get the notification message about the available volunteer donor. Secondly, this application will update the blood request status as complete for all other registered users.

IV. IMPLEMENTATION

We developed the blood donation application in open source development tool android studio [11]. Our application has two modes (i.e., donor and requester) to interact with the proposed application. In voluntary donor mode, system will ask necessary information about the name, mobile number state, city, age and blood group (i.e., Figure 2(a)). In case of requester mode, application ask patient name, age, blood type, urgency of blood, hospital name, and contact information. It can be seen from Figure 1, our system starts from user registration and then classify the users as blood donors or requester. Blood requester can broadcast the blood request and donor will access this request anywhere anytime through cloud server. Volunteer donor will response to the request and requester will be notified about it.

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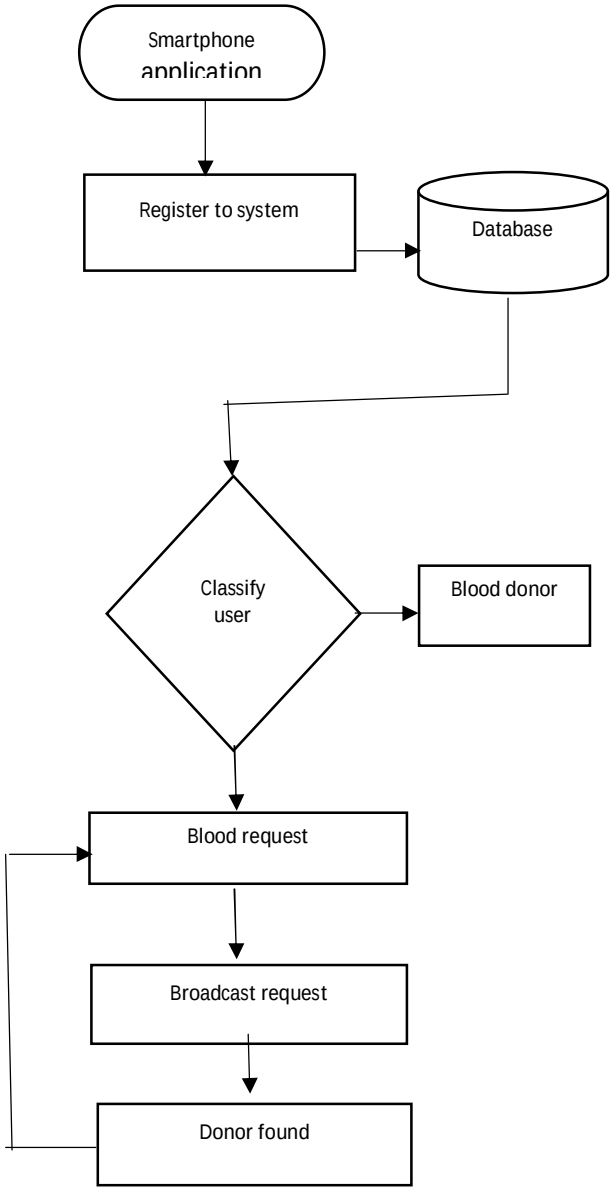

Figure 4.1 Represents Flow chart of application information flow

The proposed architecture adopts the design principle of human computer interaction to design user friendly interfaces. Figure 2 presents screenshots of the blood donation application. Where, figure 2(a) presents the login activity to enter the application by providing the credentials. In case of new user, he/she can sign in by providing the information about the name, mobile number, state, city, age and blood group as shown in Figure 2(b). Once user will register to blood donation application he/she can see the panel as shown in Figure 2(d) and existing requested blood as shown in Figure 2(e). User can ask for blood donation by filling the registration form. Once user will request for the blood an alert message will be deliver to all the register volunteer donors. In order to analyze our system, we create the requester and donors profiles. In the system, "ElifOzpelit" is one of the donor profile along all required details and shown in Figure 2(a). She can access the requester information about the blood and also make search about the specific city or blood group. A requester "Mahmut" made a blood request about blood group "A-" by search button. Once he made a request all the register donors get the alert about this broadcasted information and also provided the vaccination information to the donors who are registered in the application. By this the people who don't know in which age they have to donate blood will get details and some other information related to blood donation. We showed that the system is applicable in the real-life scenario to make sure timely access of the blood donation.

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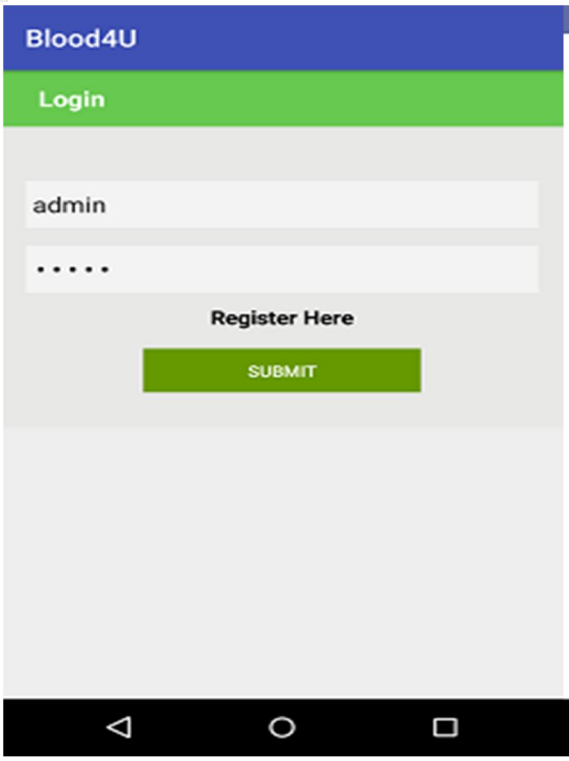

Fig 4.2 Represents Home Page

Fig 4.3 Represents Main Menu

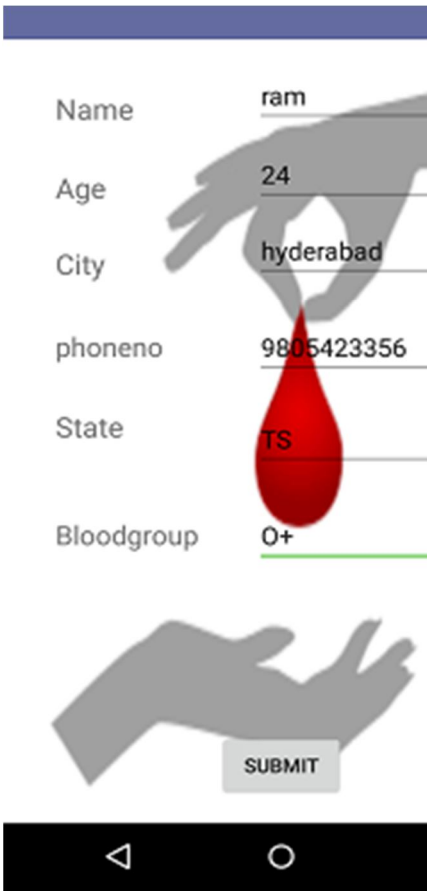

Fig 4.4 Represents Donor Page

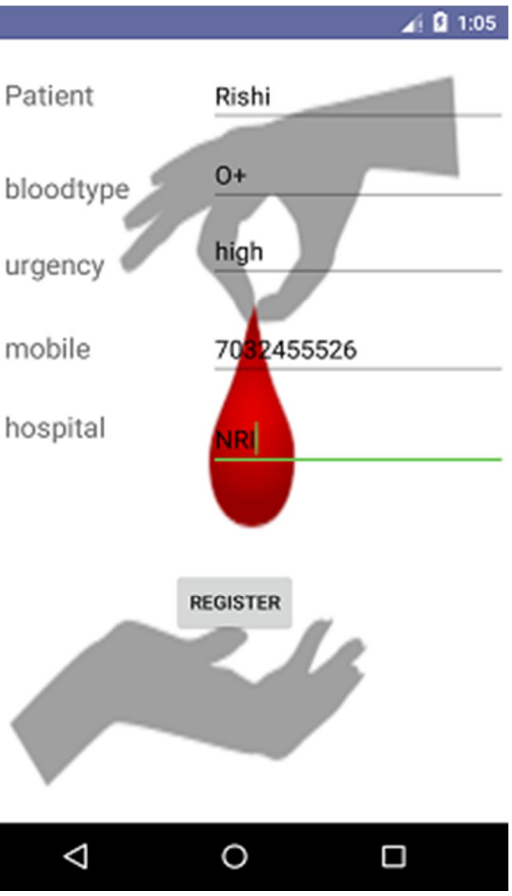

Fig 4.5 Represents Acceptor Page

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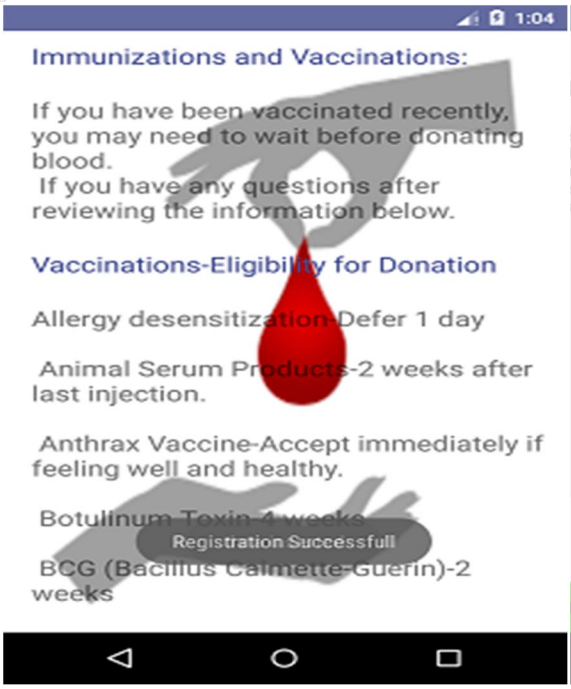

Fig 4.6 Represents Vaccination Details

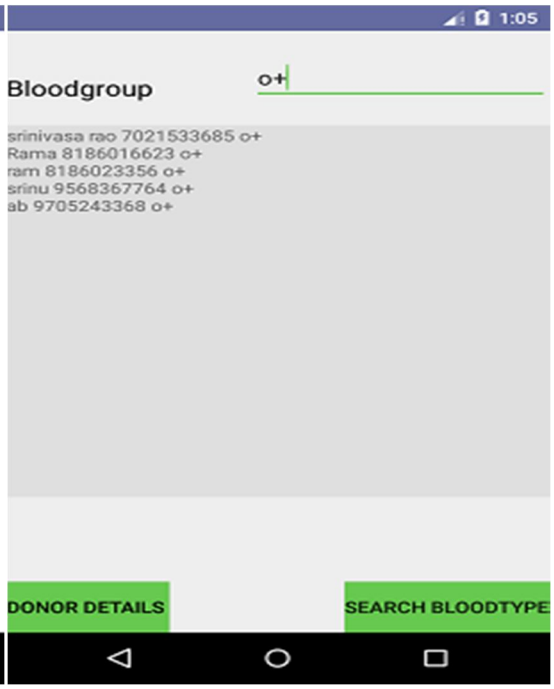

Fig 4.7 Represents O+ Donor

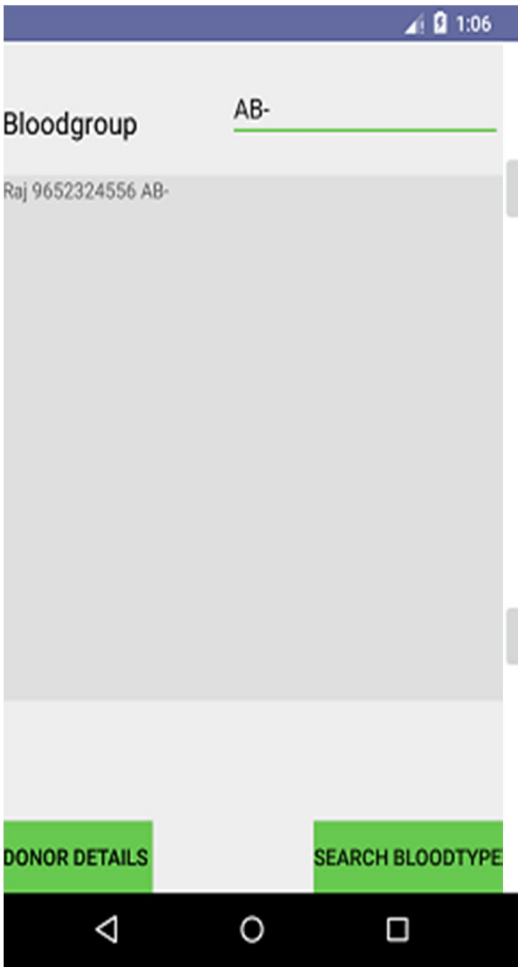

Fig 4.8 Represents AB- Donor

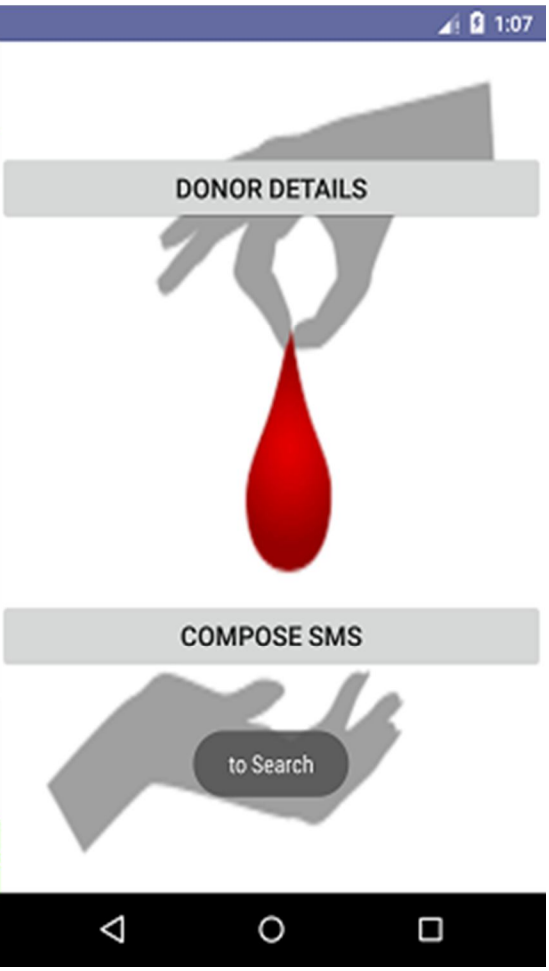

Fig 4.8 Represents Donor Details

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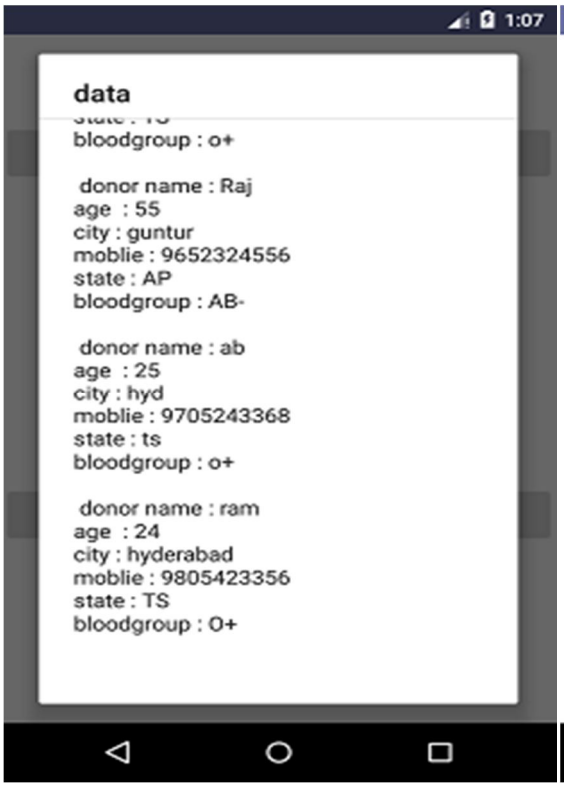

Fig 4.9 Represents Donor Data

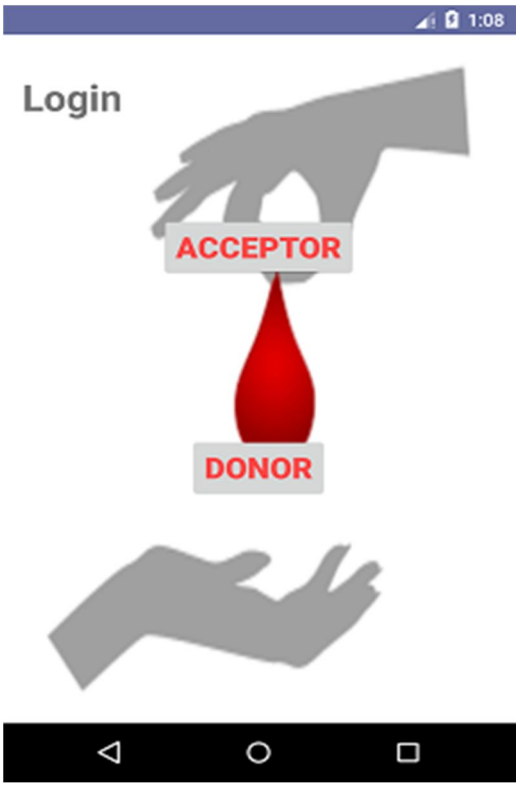

Fig 4.10 Represents Login Page

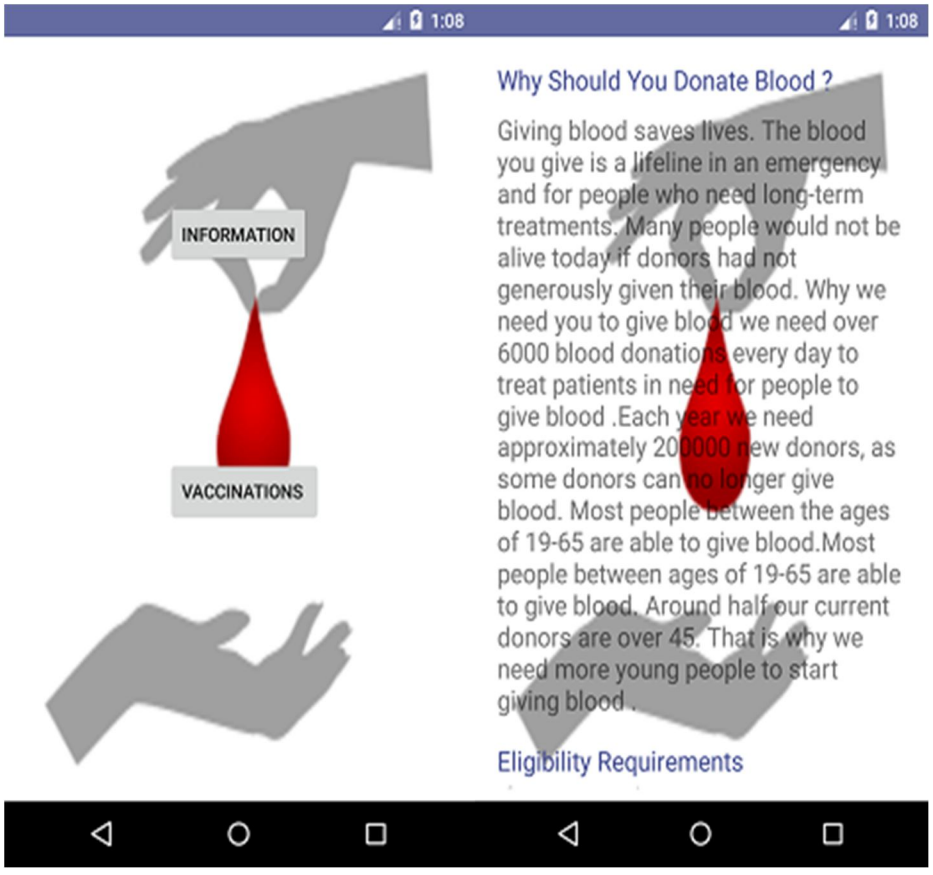

Fig 4.11 Represents Donor Login

Fig 4.12 Represents Basic Information

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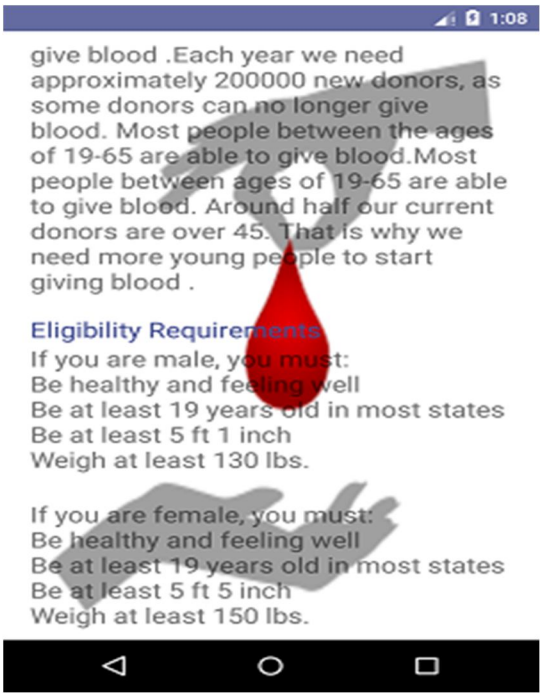

Fig 4.13 Represents Eligibility Data

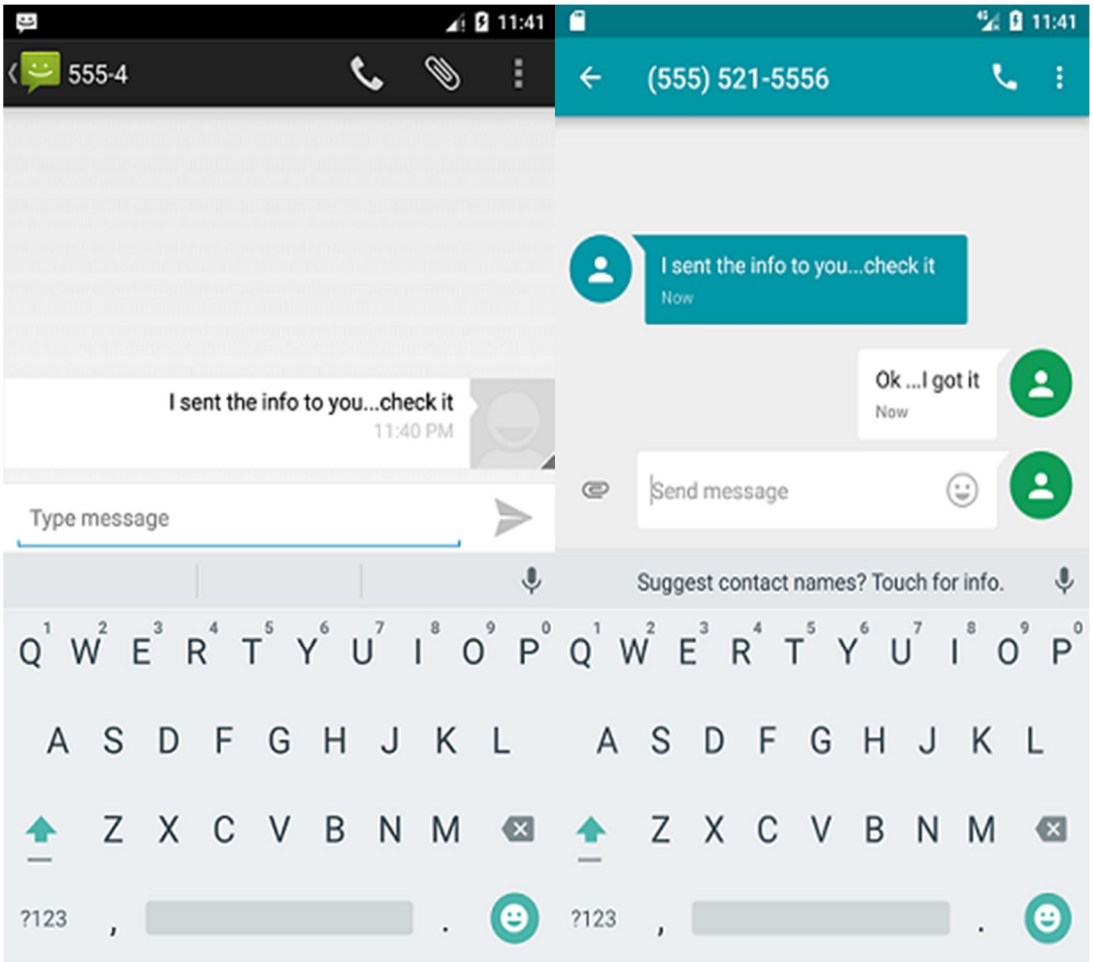

Fig 4.14 Represents Sending Message

Fig 4.15 Represents Receiving Message

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V. CONCULSION

Blood4U is one of the possible concepts for the provision of healthcare services and upgrade quality of life. This paper presented the conceptual design and prototype development of this application for blood donation. We investigate the requirements in terms of communication, storage, processing and smart phone development platform to make it an acceptable solution. We trust that our application is ubiquitous solution and may provide timely access to the blood donors and acceptor to handle the urgent situation along with vaccination details to the registered donors. In the future work, we have plan to add public service messages to our application. We also have plan to extend the functionality of the application by removing a valid donor from the information alert list for 89 days after receiving information about last donation date.

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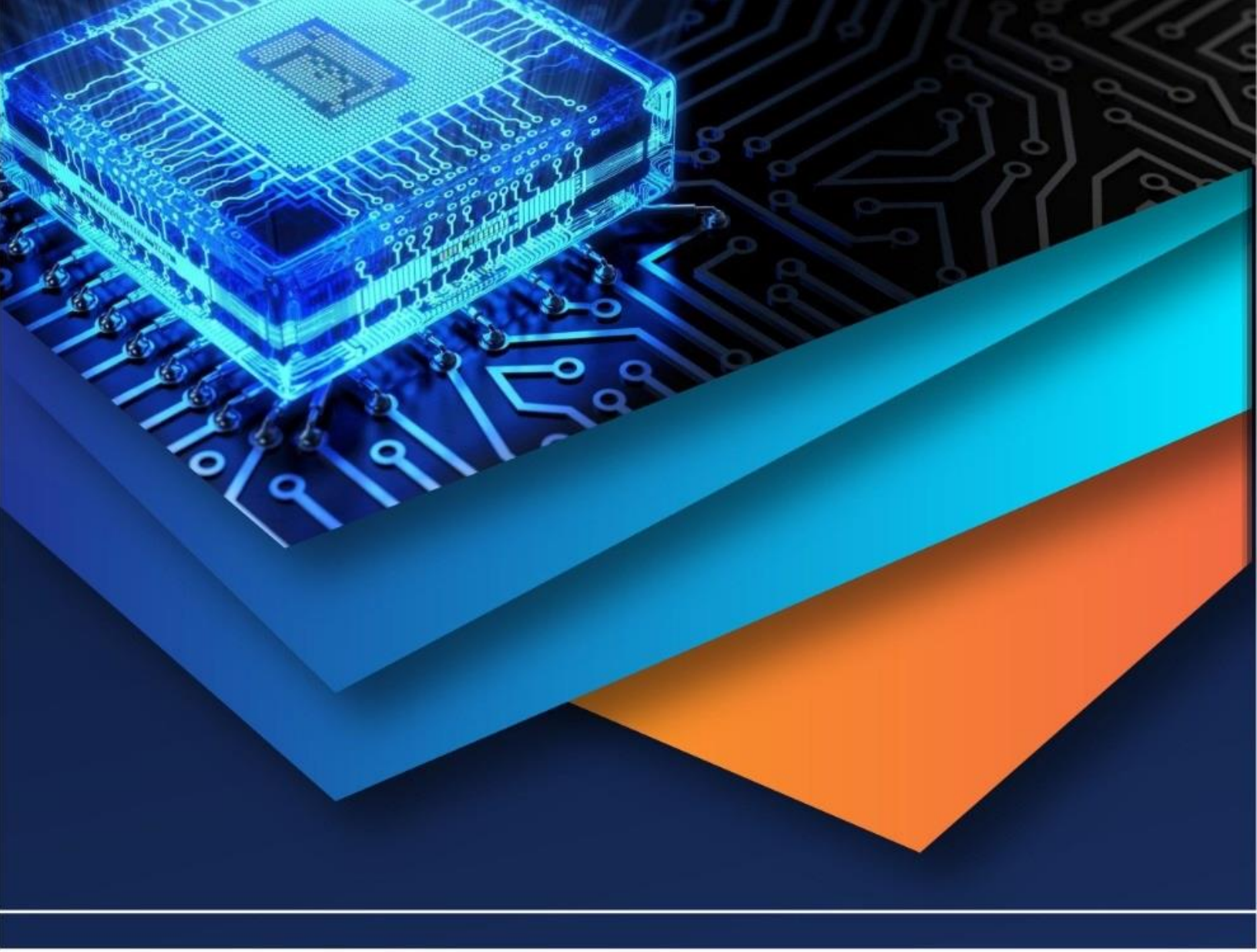

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